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A Weekly Summary of Current Science

EDITED BY WATSON DAVIS

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EDWIN E. SLOSSON, Director

WATSON DAVIS, Managing Editor



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UNIVERSE'S DENSEST STAR DISCOVERED

The densest star in the known universe has been discovered by Prof. F. C. Jordan of the Allegheny Observatory, Pittsburgh. It is as solid as the surface rocks of the earth and as compact as the planet, Mars, or the moon. Yet it shines so brightly that Prof. Jordan was able to determine that it is what astronomers call an eclipsing variable, made up of two elliptical or egg-shaped dwarf stars which whirl round and round, one of them blotting out the light of the other at regular intervals.

The newly discovered variable star, as yet designated simply as "New Variable", is not visible to naked eye since its magnitude is about eleven, but it is in the constellation of Coma Berenices, which is located a little south of the Big Dipper.

How a star can shine so brightly and yet have a density of the most enduring earthly granite is a mystery to astronomers. "New Variable" is from 3.1 to 4.8 times as solid as water and from 2.2 to 3.4 times as dense as our sun, which is a very compactly built star itself. The average density of all the stars is only one-tenth that of water. If an ordinary star were cool enough, a person might enter one, if transported there a la Jules Verne, and not realize it.

But Prof. Jordan's star is nearly as solid as the earth which, taken as a whole, is 5.5 times as dense as water. It may be more compact than the moon, which is 3.3 times water's density or Mars, which rates 3.6. It exceeds in solidity Jupiter with density of 1.6 and red Saturn which is only six-tenths as compact as water.

The life of the densest star of the known universe is nearly over, astronomically speaking. It is a dwarf that is nearing extinction, Prof. Jordan's observations show. Stars that are in the class of eclipsing variables are as a rule more dense than either the red giants such as Antares and Betelgeuse. The variable stars average in density one-eighth that of the sun, the great red giants are about one-thousandth the density of air at the surface of the earth. Most of the stars are mere vapor, even our very dense sun is only 1.4 times as solid as water, and it is understandable that their material could give off light that can be seen from the earth. But the luminescence of such a solid body as "New Variable" is puzzling to account for, astronomers declare.

The distance of the densest star from the earth has not yet been determined.

The density of "New Variable" was determined by computation based on the data for its period and the total duration of its eclipse.

The previously known star closest in character to the new star is W Ursae Majoris in the same part of the heavens, which is 2.5 times as dense as water.

"New Variable" is also the star with the shortest period yet known, amounting to about six hours. W Ursae Majoris ranks third in short periods while SW Lacertae is second.

READING REFERENCE - Hale, George E. *The New Heavens*. New York, Charles Scribner's Sons, 1922.

BORNEO ARROW POISON USED TO FIGHT INSECTS

Tuba Root, which was used by the "Wild Men of Borneo" as an arrow poison, and is still used in the Malay States as a fish poison, is a most effective insecticide, according to experiments made at Rothamsted Experimental Station, England.

Experts hope that its more extended use may relieve the shortage of nicotine, which is perhaps the most perfect insecticide known. Tuba root falls short of the ideal in that it is extremely poisonous to animals, including man; hence great care has to be exercised in its use.

Nicotine is one of a very large number of poisons obtained from plants; and the Head of the Ministry of Agriculture's Pathological Laboratory suggests that these may include a number of other substances suitable for use as insecticides. Nicotine is not produced in sufficient quantity to meet the demand for it and it is too expensive to be used in general agriculture except by growers of very high priced produce, such as hops.

Hence an investigation has been carried out by Messrs. Tattersfield and Roach of the Rothamsted Experimental Station in collaboration with Messrs. Fryer and Stenton of the Ministry of Agriculture. Thousands of caterpillars, reared by them in the Ministry's Pathological Laboratory, have been tested to determine the effect on them of the various products isolated from the plants. Great care had to be exercised in rearing the caterpillars to keep them free from parasites and in good health. This is very important, otherwise it could not be decided whether a particular caterpillar died as a result of the action of the substance tested or whether it would have died from other causes had it not been treated at all.

By far the most hopeful of the plants so far investigated is Tuba Root. It contains comparatively large percentages of a series of closely related poisons which are as toxic to caterpillars as nicotine when equal weights of the two are compared.

The workers were puzzled to find that the poisonous qualities of the root apparently decreased on storage, but they succeeded in demonstrating that this

was due to the insolubility of the poisons in water. In the green root they were suspended in the sap in an extremely finely divided state, giving it a milky appearance, and are easily extracted by macerating the root with water, as was done in the preparation of the arrow poison. On storage, however, this condition was lost through the drying of the plant and on grinding with water the dry root gave a clear extract which was quite innocuous towards caterpillars. They succeeded, however, in restoring the original potency of the poisons by extracting them with chemical solvents and suspending them in saponin solutions. In this form they were even more powerful than nicotine. This fact will be of great importance if the root is to be transported great distances before use. Either the original "milkiness" of the sap will have to be retained or the poisons will have to be extracted and re-dispersed in an extremely fine state of division in the spray fluid. Either method is quite feasible commercially.

Tuba root seems to have been used for an insecticide first by Chinese market gardeners, who macerated the root with water and sprayed their plants with the resulting milky fluid, thereby following the lead of the natives who painted this same fluid on their arrows to poison them.

The arrow poison is now used in proprietary insecticides and the demand for it on the English market is steadily increasing.

READING REFERENCE - McIndoo, Norman Eugene. Effects of nicotine as an insecticide. In U. S. Department of Agriculture Journal of Agricultural Research Vol. VII. No. 3. pp 80-122. Washington, 1916.

Anderson, O. G. and Roth, F. C. Insecticides and Fungicides and Appliances. New York, John Wiley and Sons, Inc. 1923.

NEW MINOR PLANET DISCOVERED

A new member of the solar system, an asteroid, has been discovered recently by Prof. George H. Peters of the U. S. Naval Observatory.

He occasionally finds such small planets on his photographic plates as a by-product of his regular observations. But the one that Prof. Peters has just announced is extraordinary in that it is very close to Edburga 413, an asteroid previously known and whose return to visibility was predicted by computations. Both Edburga and the newcomer are about the same magnitude, a little more than 12, and have approximately similar apparent motions. Only the telescope can detect them and they are found by their motions in the sky with respect to the fixed stars.

"I am not quite sure of the identifications," Prof. Peters stated. Only additional observations over a considerable period will settle the question of which is which on account of the similarity of motion and brightness. One of them is Edburga; the other can not be found listed in any of the catalogs and Prof. Peters believes it to be a part of the heavens previously uncharted by man.

The coincidence of two minor planets so alike and so near each other he characterized as very remarkable. For twenty years he has been observing and discover-

ing asteroids and this is the first case of apparent duplicity that he had discovered.

The discovery was made on the photographic plates of the heavens that Prof. Peters takes with the 10-inch refractor telescope of the Naval Observatory.

In December Prof. Peters found another tiny planet that had been "lost" for fifty years. Its name was Aethra 132 and it was last seen in 1873 by its discoverer, Prof. J. C. Watson of the University of Michigan.

The Indians that once roamed the city of Washington were remembered by Prof. Peters when he named an asteroid discovered by him on November 21, 1921 with the old tribal name of Anacostia.

The new planet just discovered is still too young to be named, Prof. Peters believes.

Both of these asteroids now under observation by Prof. Peters are believed to be about twenty-five miles in diameter and they shine by reflected light similarly to the large members of the planet family. They are twirling around the sun in orbits that lie between Mars and Jupiter.

READING REFERENCE - Lewis, Isabel M. Splendors of the Sky. New York, Duffield and Company, 1920.

Dr. Edwin E. Slosson

CHATS ON SCIENCE

SCIENCE AS A RECREATION

Most people think of science as a serious and solemn thing, a strain upon the strongest intellect.

So it is for the pioneers of scientific progress but not for those who merely follow along behind.

The layman does not exaggerate, in fact he does not begin to appreciate, the difficulty of original research, the devotion and self-sacrifice of men of science. A man may pursue a subject for years and then find that he has lost his labor through taking the wrong turn in the labyrinth of nature. He may count himself one of the fortunate if what he accomplishes in a lifetime is considered worthy of filling a footnote in some general compendium of science.

But however painful and slow a process may be the promotion of science its results are intended to eliminate labor and economize time. The scientist toils that others may have an easier time. It is owing to the labors of a long line

of electricians from Faraday to Bell that the housewife is able to telephone the grocer to send over the ice cream for dessert. If mechanics from Hero of Alexander to Otto of Germany had not worked over engines we would not be able to take a hundred mile ride in an auto any fine day.

Science is a thought-saving device and when applied to life it results in time-saving and labor-saving inventions.

Science means simplification. It substitutes a single rule for a million miscellaneous observations. To borrow a phrase from Poincare, science consists in giving the same name to different things. The scientist links things together by whatever they have in common. If you have a lot of loose papers to carry, or sticks of kindling wood, you will do it easier if they are tied together in a single bundle. That is what the scientist is always doing, tying up fugitive facts into compact and portable packages. Learning the 36 combinations of the multiplication table is hard work, but once you have mastered them you become master of all the multiplications in the world. Newton's law, "Action and reaction are equal and opposite", covers in seven words all possible cases of the application of force.

Because some people have to study the sciences seriously, it is no reason why the rest of us should not chat about them or joke about them. We may make light of ponderous matters and even treat gravity with levity without danger of irreverence.

READING REFERENCE - Curtis, Winterton C. *Science and Human Affairs*. New York, Harcourt, Brace and Company, 1922.

Sedgwick, W. T. and Tyler, H. W. *A short History of Science*. New York, Macmillan Company, 1921.

GODDESS OF HUNTING RULES

ESKIMOS BY STRICT TABOOS

By Knud Rasmussen,
Leader, Danish Arctic Expedition,
Now in Far North.

(This article was written in the Arctic at Lyon Inlet north of Hudson Bay.)

The religious ideas of the Eskimos which deeply influence their daily life center around Nuliajuk, the goddess of hunting, who lives at the bottom of the sea. She is a powerful divinity who knows how to rule everything, makes it impossible for human beings to sustain life, and also possesses an unlimited power over all destinies. She is not worshipped, but due respect is shown to her through an extremely complicated system of taboos which must be kept scrupulously in order not to rouse her anger. In this short article I cannot enter into the details of these troublesome taboos but will only show, by a single example, how great a part they play. At the proper time for reindeer hunting, the hunting of sea animals is not permitted, nor in consequence thereof are the Eskimos

allowed to carry the fresh meat of sea animals or fresh blubber into the tents or the snow-huts. If one desires seal-meat or blubber, this must be taken from old depots, and must not be eaten on the same days as land animals and salmon. No new clothes of reindeer skins must be made so long as people live in tents; old clothes can be repaired, but not with new skins. Making the new winter clothes is not allowed until after the Eskimos have moved into their snow-huts, and as the snow is not suitable for the building of snow-huts until October this means that people must freeze gallantly in the cold tents. At the time when the clothes are made the catching of sea animals is not permitted, even if there are no reindeers. As the dressing and sewing of the skins into clothes for the whole family generally takes a couple of months, seal hunting is often tabooed at the very time when there are chances of good hunting.

The meat of foxes, wolves and dogs is always taboo, and in several cases we have seen how people preferred to starve to death rather than to break this instruction. The rules are almost innumerable, and as the Eskimos are extremely orthodox, one understands that their religion does not make life easier for them.

All Can Read

These superstitions, this clinging to traditions is in itself peculiar, after taking into consideration that nearly all, adults as well as children, are able to read and write. They teach themselves. The writing is by syllables in simple and easily reproduced symbols which were introduced into this district by people from Baffin Land who came over with the whalers. From a phonetic point of view this alphabet is rather defective, but with a little practice in the use of it these difficulties are easily surmounted. The New Testament and various hymnals are books very commonly found among them, but as none of the missionaries have tried to teach them or to give them the presuppositions for the understanding of the books, they are merely read for pleasure. But it is perhaps for this very reason that they have throughout preserved their original religious ideas. Of the Igdluliks, Peter Freuchen, of this expedition, tells that "they surprised us by being Christians". They had been converted this winter by a man who had come from Ponds Inlet and there had met a missionary and learned some hymns and prayers. The people had strong religious interests and it took a good deal of time since they were called out to sing hymns whenever a sledge came in or departed, even if it were only a journey of a few hours. All houses and sledges carry a white flag, which is their symbol, and crucifixes are placed as amulets everywhere in the houses and on the sledges. Whether they were Catholics or Protestants it was not possible to discover, their belief is chiefly in dreams which are sent by God, and Freuchen found that they consider him as a special emissary from heaven, mostly on account of his beard. Two of the men had two wives which up here, however, does not run contrary to Christianity as long as they had them before they were converted.

WAVE-LENGTH FADING AS RADIO TERM

"Wave-length" will eventually be an obsolete radio term according to the U. S. Bureau of Standards. The approved term is "Kilocycles", abbreviated kc.

Government experts believe that the use of the frequency of radio waves, expressed as thousands of cycles per second (kilocycles), has many advantages

over the length of the wave.

"The separation of the frequencies of transmitting stations to prevent interference is an important matter, and the necessary separation as expressed in frequency is the same no matter what the frequencies of the two stations may be, while it is variable and quite misleading when expressed in meters," a statement says. "Thus, the frequency band existing between 150 to 200 meters (2000 to 1500 kc) is enormously wider than the band from 1000 to 1050 meters (300 to 286 kc). While it is possible to carry on 50 simultaneous radio telephone communications between 150 and 200 meters, only one could be carried on between 1000 and 1050 meters."

It is very simple to obtain the approximate relation between kilocycles and meters. For example, knowing the wave length in meters, divide 300,000 by the number of meters to obtain the frequency in kilocycles, or knowing the wave length in kilocycles, divide 300,000 by the number of kilocycles which will give the wave length in meters.

Ordinary telephone currents, ranging from 16 to 3,000 cycles per second, and radio waves, from 10,000 to 30,000,000 cycles per second, are both the same electrical vibrations although differing in their frequency.

----- CACTUS-DRUG CREATES WEIRD INDIAN RELIGION

Peyotism, weirdest cult that ever has worn the crown of Christianity, is in its last stages.

It is, observers, say, the most picturesque religion developed in the United States. Its leaders interpret certain books of the New Testament, most notably the Apocalypse, in terms of pagan Indian rites.

The crown of thorns, for example, is symbolized by a cap of beaver skin. The head men of the cult, in conducting ceremonies, wear the feathered headpiece of an Indian chief with a cross marked on the feathers.

The basis of the religion is the fact that all rites are conducted while under the influence of peyote. This is a native drug contained in the tops of the spineless cactus, known as mescal buttons, which grows in the Southwestern states. This drug, as is well known, produces in the user a heightened degree of religious emotionalism. This cult, however, is vastly different from the peyote cults of Oklahoma, whose dances while under the influence of the drug the Office of Indian Affairs has recently made efforts to do away with.

From the spineless cactus, by the way, is made the particular vicious whisky of the border half breeds and Mexicans. The peyote devotees, however, chew it, or occasionally steep the buttons and drink the result.

The cult has flourished until recently among the Winnebago Indians of the Middle West. Its devotionals have been brought to the attention of science by Paul Radin, who conducted a study of the Winnebago customs and traditions the results of which have just been published by the Bureau of American Ethnology of the Smithsonian Institution here.

The Mohammed of peyotism was John Rave, a ne'er-do-well of the tribe who drifted among Oklahoma Indians and became a victim of the peyote eating habit. But Rave evidently was a man of considerable imagination. The weird visions which came to him while under the influence of the drug he interpreted in terms of the Revelations and returned to his own people with the new religion ready made.

This was about the year 1900. The new cult took a firm hold among the red men but it was not until the coming of Arthur Hensley, a Carlisle graduate, a Bible student, and a man of militant Puritanism, that the real breath of life was breathed into the creed. To Hensley is due much of the formality which attends the services.

During late years, however, Radin reports, the devotees are falling away rapidly. Some are drifting from church affiliations altogether. Others are joining the conventional Protestant churches.

The picturesqueness of the creed cannot be gainsaid. Take, for instance, the Christmas ceremonies. On the morning before Christmas the leader locates a great lodge by the position of sunrise and builds a half moon fire place in the center which is lighted at night. Then he spends the day in prayer. At midnight Christmas Eve, with the entire membership gathered, he blows a flute to each of the four corners of the lodge, announcing that the Savior has come upon the earth. At daybreak again the flute is blown in the same fashion, this time to represent the trumpet of the day of judgment when Christ shall return. Throughout the ceremony the leader wears an otter skin cap, representing the crown of thorns of the Redeemer. In between times the drinking of peyote continues.

More frequent peyote ceremonials consist of a general confessional meeting. The worshippers gather in the evening and listen to sermons and hymns until about midnight. All the time they chew peyote. By the time the preaching and singing is over they are in an emotional state of mind which impells them to tell all their sins in public meeting. Then they go about the hall shaking hands and asking forgiveness of each other. This closes the meeting.

READING REFERENCE - Radin, Paul. The Influence of the Whites on Winnebago Culture. Madison, Wis. Proceedings of State Historical Society of Wisconsin, 1913.

WOMEN'S VOTES ESTABLISHED INDIAN LEAGUE OF NATIONS

New York Indians in the Stone Age had a constitutional League of Nations for the promotion of universal peace which was based on and dominated by woman's suffrage and in which the initiative, referendum, and recall were employed, so J. N. B. Hewitt, ethnologist of the Smithsonian Institution who has just returned to Washington from an investigation among the Iroquois of New York and Canada, declared recently. Chieftainesses among the confederated Mohawk, Onandaga, Oneida, Cayuga, and Seneca tribes had equal rights and titles with the male chiefs who were nominated by women's votes, his most recent researches into the governmental plan of these Five Nations revealed.

The scope of the league formed among these Indians in the sixteenth century, Mr. Hewitt said, was not limited to the five Iroquoian tribes, but they proposed to bring under their form of government all known tribes of men, not as subject peoples but as confederates. The league was based on peace, righteousness, justice, power, and health. Laws were provided to stop family feuds and regulations for the promotion of mental hygiene were laid down.

Hiawatha was one of the League chiefs selected by the women and subject to recall by them, he said. Longfellow's poem about Hiawatha, he explained, was absolutely absurd and untrue from an ethnological standpoint as he confused this historical leader with mythical tales of an ancient Iroquoian god.

Mr. Hewitt found that the automobile, the phonograph, and other modern products are rapidly causing the Indians to forget many of their former laws and customs.

X-RAY FORETELLS HEART TROUBLE

How the X-ray may be used to detect heart weakness, not apparent by other methods of examination, even before the patient has a complaint, is told in a report by Dr. Harry Spiro, cardio-vascular specialist, to the Radiological Society of North America at its recent meeting in San Francisco.

Heart weaknesses can be discovered, he explained, by simply comparing the two sides of the beating heart as seen under the fluoroscope. The left side of the heart is normally the stronger pump; the muscles of the right side do not normally contract vigorously. If the left side resembles the right side in the size of its pulsatory waves, he said, it can then be said that the two sides are equal in strength, and that, therefore, the left ventricle is not as strong as it should be normally.

Dr. Spiro declared that this method of diagnosing the quality of heart muscle before trouble sets in has important possibilities.

READING REFERENCE - Bulletin on Studies in Roentgen-Ray Diagnosis. Washington, Government Printing Office, 1915.

Hirsch, I. Seth. The Principles and Practices of Roentgenological Technique. New York, American X-Ray Publishing Company, 1920.

Outline of Science, edited by J. Arthur Thomson. pp 184-6 and pp 249-51. New York, G. P. Putnam and Sons, 1922.

William Harvey, the great English physician who in 1651 demonstrated the circulation of the blood in the body, was fond of the classics and is recorded to have been found in the danger zone of a battle reading Virgil.

TABLOID BOOK REVIEW

PRACTICAL CHEMISTRY. By Lyman C. Newell, Professor of Chemistry, Boston University. D. C. Heath & Co. 1922. \$1.92

Of all text-books, one on chemistry is probably the hardest to write, owing to the enormous field to be covered and the few points at which this field touch our daily lives. Dr. Newell is to be congratulated on getting away from the old plan of "Part I, Laws; Part II, Description". His attempt, too, to progress from the known to the unknown is more successful than many. The most general criticism which we would make is the terseness of the definitions and descriptions given throughout the book. If we remember our school-days aright, these phrases are altogether too easily memorized. If the student is told too much in the text, he is expected to discover too much in the exercises at the end of the chapters. Doubtless the author discusses these problems with his students and stimulates them to the necessary outside research, but with the average teacher we fear they will simply be skipped.

The author's heresy in regard to Mendelejeff's Law is a little shocking. The periodic law, to be sure, comes far from telling the whole story, but for bringing order out of the chaos of chemical elements we know nothing better, if used in connection with the list of atomic numbers and the new theories of atom structure. Our author just gets around to atomic members on the next to the last page. The doctrine of elements gaining and losing electrons, also barely touched upon, is, we think, too confusing even to mention in a beginner's book unless it can be explained very fully.

The portraits of famous chemists, introduced to furnish human interest, would gain if the first names, or even initials were given. A few facts about these men's lives would help the object in mind, although we realize that space is precious. In connection with the pictures, the date of Morley's death is not given; and the picture of Professor Richards, while doubtless an excellent likeness when it was taken, would hardly help the student to recognize him in a crowd to-day.

In harmony with the title, the practical industrial processes are dealt with very fully. Yet when one important industrial chemical is defined; "Cement is a kind of strong, firm mortar . . . it is often called Portland cement", we wonder whether the text-book writer would not better be content to give basic principles in simple form and leave descriptions and processes to specialists who understand the fine detail.

It seems to be difficult to make chemistry practical without sacrificing the fascinating theory which alone keeps the chemist's spirit above the sooty and sulphurous atmosphere of mere industrial receipts.

H.M.D.

Thirty-six Laysan Finches from Midway Island in the Pacific, the first of these birds ever imported, were recently received at the National Zoological Park.
